

Администрирование сетевых подсистем

Лабораторная работа №11

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04 декабря 2025

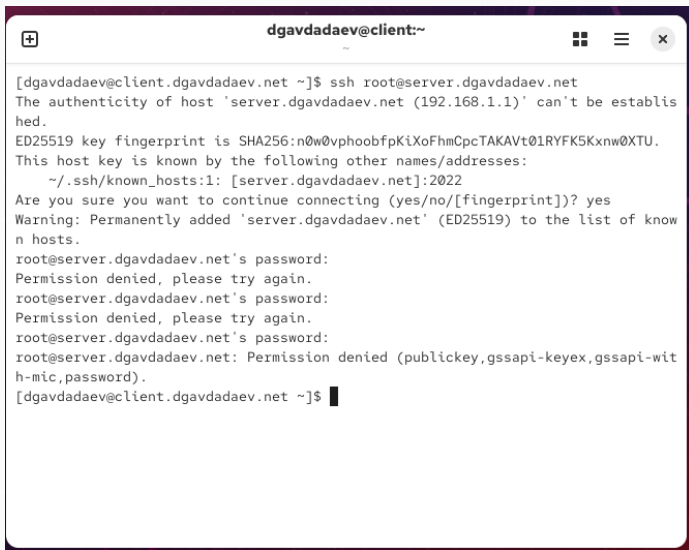
Российский университет дружбы народов, Москва, Россия

Цель работы

Приобретение практических навыков по настройке безопасного удалённого доступа к серверу по протоколу SSH.

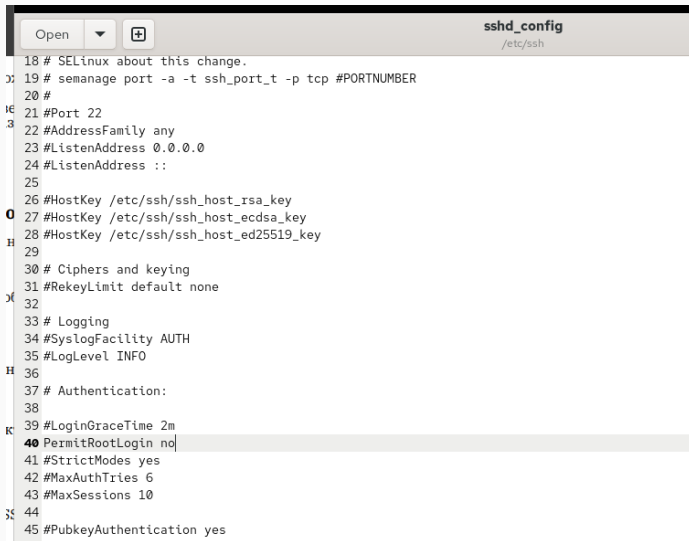
Ход выполнения

Попытка входа под root



```
dgavdadaev@client:~  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh root@server.dgavdadaev.net  
The authenticity of host 'server.dgavdadaev.net (192.168.1.1)' can't be established.  
ED25519 key fingerprint is SHA256:n0w0vphoobfpKiXoFhmCpcTAKAVt01RYFK5Kxnw0XTU.  
This host key is known by the following other names/addresses:  
  ~/.ssh/known_hosts:1: [server.dgavdadaev.net]:2022  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added 'server.dgavdadaev.net' (ED25519) to the list of known hosts.  
root@server.dgavdadaev.net's password:  
Permission denied, please try again.  
root@server.dgavdadaev.net's password:  
Permission denied, please try again.  
root@server.dgavdadaev.net's password:  
root@server.dgavdadaev.net: Permission denied (publickey,gssapi-keyex,gssapi-with-mic,password).  
[dgavdadaev@client.dgavdadaev.net ~]$
```

Настройка запрета root-доступа



```
18 # SELinux about this change.
19 # semanage port -a -t ssh_port_t -p tcp #PORTNUMBER
20 #
21 #Port 22
22 #AddressFamily any
23 #ListenAddress 0.0.0.0
24 #ListenAddress ::
25
26 #HostKey /etc/ssh/ssh_host_rsa_key
27 #HostKey /etc/ssh/ssh_host_ecdsa_key
28 #HostKey /etc/ssh/ssh_host_ed25519_key
29
30 # Ciphers and keying
31 #RekeyLimit default none
32
33 # Logging
34 #SyslogFacility AUTH
35 #LogLevel INFO
36
37 # Authentication:
38
39 #LoginGraceTime 2m
40 PermitRootLogin no
41 #StrictModes yes
42 #MaxAuthTries 6
43 #MaxSessions 10
44
45 #PubkeyAuthentication yes
```

Рис. 2: sshd_config — запрет root

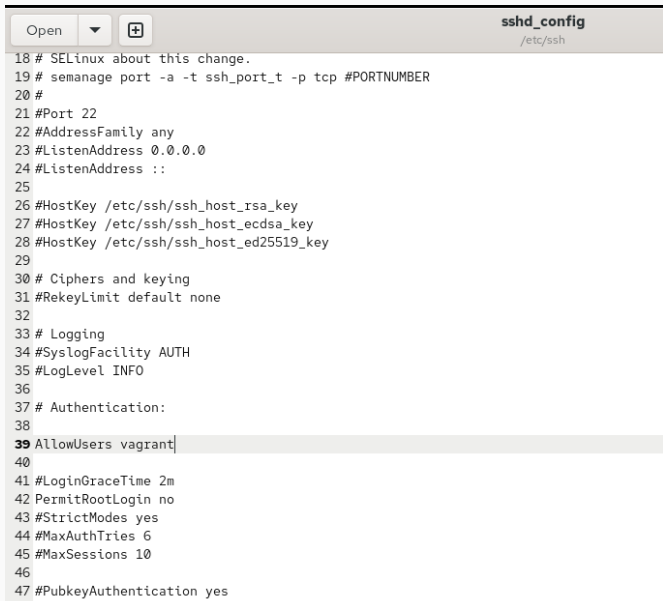
```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh root@server.dgavdadaev.net  
root@server.dgavdadaev.net's password:  
Permission denied, please try again.  
root@server.dgavdadaev.net's password:  
Permission denied, please try again.  
root@server.dgavdadaev.net's password:  
root@server.dgavdadaev.net: Permission denied (publickey,gssapi-keyex,gssapi-wit  
h-mic,password).  
[dgavdadaev@client.dgavdadaev.net ~]$
```

Рис. 3: Отказ после запрета root

```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net  
dgavdadaev@server.dgavdadaev.net's password:  
Web console: https://server.dgavdadaev.net:9090/ or https://10.0.2.15:9090/  
  
Last login: Thu Dec  4 09:09:01 2025  
[dgavdadaev@server.dgavdadaev.net ~]$  
logout  
Connection to server.dgavdadaev.net closed.  
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 4: Успешный вход пользователя

Настройка AllowUsers

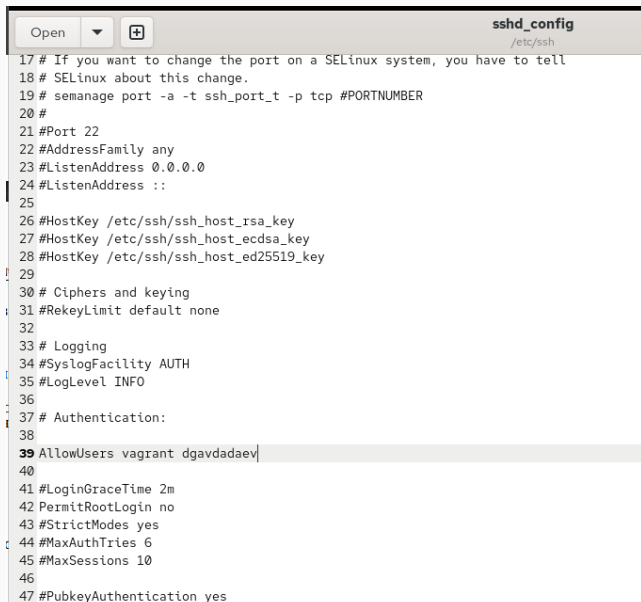


```
Open ▼ + sshd_config
/etc/ssh
18 # SELinux about this change.
19 # semanage port -a -t ssh_port_t -p tcp #PORTNUMBER
20 #
21 #Port 22
22 #AddressFamily any
23 #ListenAddress 0.0.0.0
24 #ListenAddress ::
25
26 #HostKey /etc/ssh/ssh_host_rsa_key
27 #HostKey /etc/ssh/ssh_host_ecdsa_key
28 #HostKey /etc/ssh/ssh_host_ed25519_key
29
30 # Ciphers and keying
31 #RekeyLimit default none
32
33 # Logging
34 #SyslogFacility AUTH
35 #LogLevel INFO
36
37 # Authentication:
38
39 AllowUsers vagrant
40
41 #LoginGraceTime 2m
42 PermitRootLogin no
43 #StrictModes yes
44 #MaxAuthTries 6
45 #MaxSessions 10
46
47 #PubkeyAuthentication yes
```

```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net  
dgavdadaev@server.dgavdadaev.net's password:  
Permission denied, please try again.  
dgavdadaev@server.dgavdadaev.net's password:  
Permission denied, please try again.  
dgavdadaev@server.dgavdadaev.net's password:  
dgavdadaev@server.dgavdadaev.net: Permission denied (publickey,gssapi-keyex,gssapi-with-mic,password).  
[dgavdadaev@client.dgavdadaev.net ~]$
```

Рис. 6: Отказ пользователя dgavdadaev

Расширение AllowUsers



The image shows a text editor window titled 'sshd_config' with the path '/etc/ssh' below it. The editor contains the following configuration lines:

```
17 # If you want to change the port on a SELinux system, you have to tell
18 # SELinux about this change.
19 # semanage port -a -t ssh_port_t -p tcp #PORTNUMBER
20 #
21 #Port 22
22 #AddressFamily any
23 #ListenAddress 0.0.0.0
24 #ListenAddress ::
25
26 #HostKey /etc/ssh/ssh_host_rsa_key
27 #HostKey /etc/ssh/ssh_host_ecdsa_key
28 #HostKey /etc/ssh/ssh_host_ed25519_key
29
30 # Ciphers and keying
31 #RekeyLimit default none
32
33 # Logging
34 #SyslogFacility AUTH
35 #LogLevel INFO
36
37 # Authentication:
38
39 AllowUsers vagrant dgavdadaev|
40
41 #LoginGraceTime 2m
42 PermitRootLogin no
43 #StrictModes yes
44 #MaxAuthTries 6
45 #MaxSessions 10
46
47 #PubkeyAuthentication yes
```

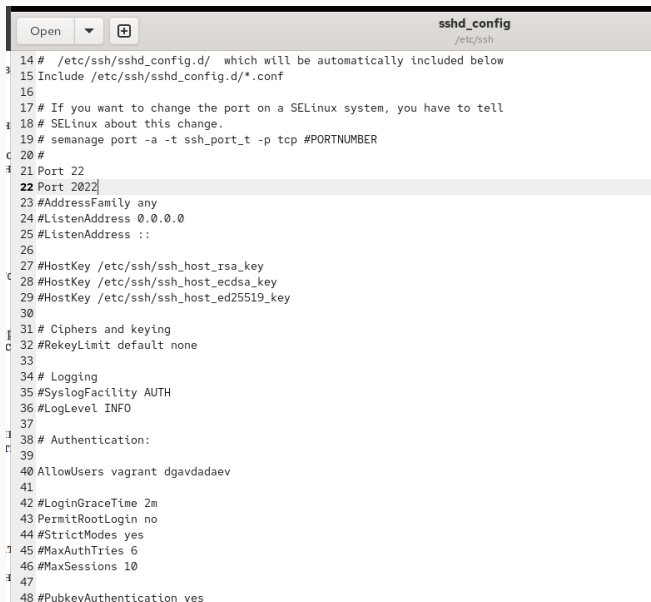
The line '39 AllowUsers vagrant dgavdadaev|' is highlighted in a light gray background.

```
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net
dgavdadaev@server.dgavdadaev.net's password:
Web console: https://server.dgavdadaev.net:9090/ or https://10.0.2.15:9090/

Last failed login: Thu Dec  4 09:17:30 UTC 2025 from 192.168.1.30 on ssh:notty
There were 3 failed login attempts since the last successful login.
Last login: Thu Dec  4 09:16:22 2025 from 192.168.1.30
[dgavdadaev@server.dgavdadaev.net ~]$
logout
Connection to server.dgavdadaev.net closed.
[dgavdadaev@client.dgavdadaev.net ~]$
```

Рис. 8: Успешный вход

Добавление второго порта



```
sshd_config
/etc/ssh

14 # /etc/ssh/sshd_config.d/ which will be automatically included below
15 Include /etc/ssh/sshd_config.d/*.conf
16
17 # If you want to change the port on a SELinux system, you have to tell
18 # SELinux about this change.
19 # semanage port -a -t ssh_port_t -p tcp #PORTNUMBER
20 #
21 Port 22
22 Port 2022
23 #AddressFamily any
24 #ListenAddress 0.0.0.0
25 #ListenAddress ::
26
27 #HostKey /etc/ssh/ssh_host_rsa_key
28 #HostKey /etc/ssh/ssh_host_ecdsa_key
29 #HostKey /etc/ssh/ssh_host_ed25519_key
30
31 # Ciphers and keying
32 #RekeyLimit default none
33
34 # Logging
35 #SyslogFacility AUTH
36 #LogLevel INFO
37
38 # Authentication:
39
40 AllowUsers vagrant dgavdadaev
41
42 #LoginGraceTime 2m
43 PermitRootLogin no
44 #StrictModes yes
45 #MaxAuthTries 6
46 #MaxSessions 10
47
48 #PubkeyAuthentication yes
```

Ошибка SELinux

```
[root@server.dgavdadaev.net ~]#  
[root@server.dgavdadaev.net ~]# systemctl restart sshd  
[root@server.dgavdadaev.net ~]# systemctl status sshd  
● sshd.service - OpenSSH server daemon  
   Loaded: loaded (/usr/lib/systemd/system/sshd.service; enabled; preset: enabled)  
   Active: active (running) since Thu 2025-12-04 09:20:26 UTC; 6s ago  
 Invocation: c2de27b36b71414899d3f811393c1cd9  
    Docs: man:sshd(8)  
          man:sshd_config(5)  
 Main PID: 15687 (sshd)  
   Tasks: 1 (limit: 10278)  
  Memory: 1.3M (peak: 1.5M)  
     CPU: 4ms  
  CGroup: /system.slice/sshd.service  
          └─15687 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"  
  
Dec 04 09:20:26 server.dgavdadaev.net systemd[1]: Starting sshd.service - OpenSSH server daemon...  
Dec 04 09:20:26 server.dgavdadaev.net sshd[15687]: error: Bind to port 2022 on 0.0.0.0 failed: Permission denied.  
Dec 04 09:20:26 server.dgavdadaev.net sshd[15687]: error: Bind to port 2022 on :: failed: Permission denied.  
Dec 04 09:20:26 server.dgavdadaev.net systemd[1]: Started sshd.service - OpenSSH server daemon.  
Dec 04 09:20:26 server.dgavdadaev.net sshd[15687]: Server listening on 0.0.0.0 port 22.  
Dec 04 09:20:26 server.dgavdadaev.net sshd[15687]: Server listening on :: port 22.  
[root@server.dgavdadaev.net ~]# █
```

Разрешение порта в SELinux

и firewall

```
[root@server.dgavdadaev.net ~]# semanage port -a -t ssh_port_t -p tcp 2022  
[root@server.dgavdadaev.net ~]# firewall-cmd --add-port=2022/tcp  
success  
[root@server.dgavdadaev.net ~]# firewall-cmd --add-port=2022/tcp --permanent  
success  
[root@server.dgavdadaev.net ~]# systemctl restart sshd  
[root@server.dgavdadaev.net ~]# systemctl status sshd  
● sshd.service - OpenSSH server daemon  
   Loaded: loaded (/usr/lib/systemd/system/sshd.service; enabled; preset: enabled)  
   Active: active (running) since Thu 2025-12-04 09:22:20 UTC; 4s ago  
 Invocation: 516b008abald411faa60dbdd5f625917  
    Docs: man:sshd(8)  
          man:sshd_config(5)  
 Main PID: 15982 (sshd)
```

Подключение по порту 2022

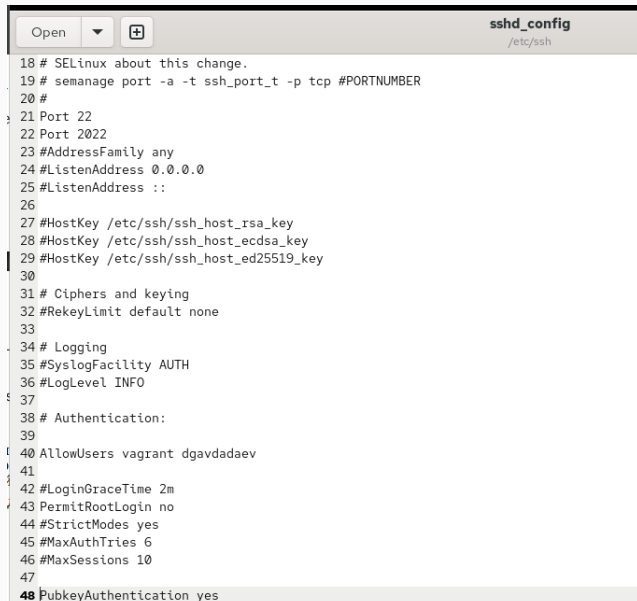
```
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net
dgavdadaev@server.dgavdadaev.net's password:
Web console: https://server.dgavdadaev.net:9090/ or https://10.0.2.15:9090/

Last login: Thu Dec  4 09:18:43 2025 from 192.168.1.30
[dgavdadaev@server.dgavdadaev.net ~]$ sudo -i
[sudo] password for dgavdadaev:
[root@server.dgavdadaev.net ~]#
logout
[dgavdadaev@server.dgavdadaev.net ~]$
logout
Connection to server.dgavdadaev.net closed.
[dgavdadaev@client.dgavdadaev.net ~]$
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net -p2022
dgavdadaev@server.dgavdadaev.net's password:
Web console: https://server.dgavdadaev.net:9090/ or https://10.0.2.15:9090/

Last login: Thu Dec  4 09:22:49 2025 from 192.168.1.30
[dgavdadaev@server.dgavdadaev.net ~]$ sudo -i
[sudo] password for dgavdadaev:
[root@server.dgavdadaev.net ~]#
logout
[dgavdadaev@server.dgavdadaev.net ~]$
logout
Connection to server.dgavdadaev.net closed.
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 11: Подключение по 2022

Включение PubkeyAuthentication



```
18 # SELinux about this change.
19 # semanage port -a -t ssh_port_t -p tcp #PORTNUMBER
20 #
21 Port 22
22 Port 2022
23 #AddressFamily any
24 #ListenAddress 0.0.0.0
25 #ListenAddress ::
26
27 #HostKey /etc/ssh/ssh_host_rsa_key
28 #HostKey /etc/ssh/ssh_host_ecdsa_key
29 #HostKey /etc/ssh/ssh_host_ed25519_key
30
31 # Ciphers and keying
32 #RekeyLimit default none
33
34 # Logging
35 #SyslogFacility AUTH
36 #LogLevel INFO
37
38 # Authentication:
39
40 AllowUsers vagrant dgavdadaev
41
42 #LoginGraceTime 2m
43 PermitRootLogin no
44 #StrictModes yes
45 #MaxAuthTries 6
46 #MaxSessions 10
47
48 PubkeyAuthentication yes
```



```
|      . o.*o.|
|      S =.B+. |
|      ..o++o+= .|
|      .* = ..|
|      o o. . o|
|      E . .. .o|
+-----[SHA256]-----+
[dgavdadaev@client.dgavdadaev.net ~]$ ssh-copy-id dgavdadaev@server.dgavdadaev.net
/usr/bin/ssh-copy-id: INFO: Source of key(s) to be installed: ssh-add -L
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are a
lready installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to in
stall the new keys
dgavdadaev@server.dgavdadaev.net's password:

Number of key(s) added: 1

Now try logging into the machine, with: "ssh 'dgavdadaev@server.dgavdadaev.net'"
and check to make sure that only the key(s) you wanted were added.

[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net
Web console: https://server.dgavdadaev.net:9090/ or https://10.0.2.15:9090/

Last login: Thu Dec  4 09:23:06 2025 from 192.168.1.30
[dgavdadaev@server.dgavdadaev.net ~]$
logout
Connection to server.dgavdadaev.net closed.
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 13: Безпарольный вход

```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ lsof | grep TCP  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh -fNL 8080:localhost:80 dgavdadaev@server.dgavdadaev.net  
[dgavdadaev@client.dgavdadaev.net ~]$ lsof | grep TCP  
ssh      15464      dgavdadaev    3u      IPv4            97552      0t0      T  
CP client.dgavdadaev.net:55592->mail.dgavdadaev.net:ssh (ESTABLISHED)  
ssh      15464      dgavdadaev    4u      IPv6            97562      0t0      T  
CP localhost:webcache (LISTEN)  
ssh      15464      dgavdadaev    5u      IPv4            97563      0t0      T  
CP localhost:webcache (LISTEN)  
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 14: TCP после туннеля

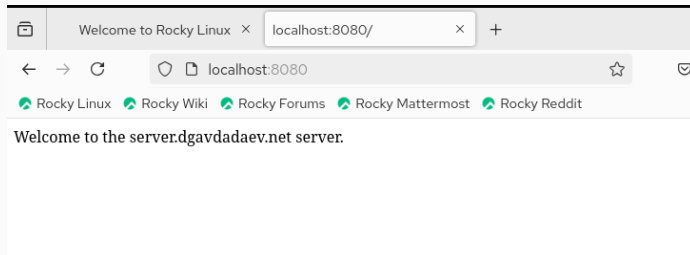
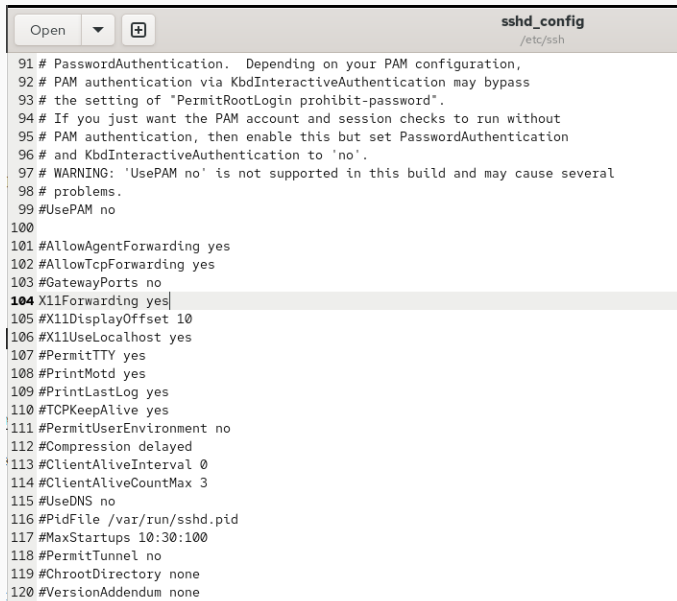


Рис. 15: localhost:8080

```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh dgavdadaev@server.dgavdadaev.net MAIL=~/.Maildir mail  
s-nail version v14.9.24. Type '?' for help  
/home/dgavdadaev/Maildir: 3 messages 1 unread  
   1 dgavdadaev      2025-11-30 11:04   18/668   "test1           "  
   2 dgavdadaev@client.dg  2025-11-30 11:18   21/859   "LMTP test       "  
▶U  3 dgavdadaev      2025-11-30 11:38   22/840   "test3           "  
q  
Held 3 messages in /home/dgavdadaev/Maildir  
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 16: Просмотр почты

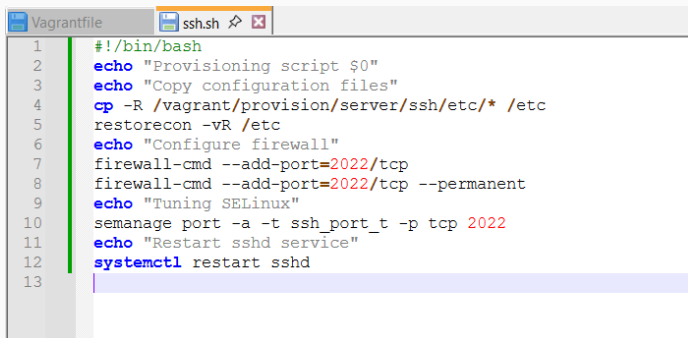
Включение X11Forwarding



```
91 # PasswordAuthentication. Depending on your PAM configuration,
92 # PAM authentication via KbdInteractiveAuthentication may bypass
93 # the setting of "PermitRootLogin prohibit-password".
94 # If you just want the PAM account and session checks to run without
95 # PAM authentication, then enable this but set PasswordAuthentication
96 # and KbdInteractiveAuthentication to 'no'.
97 # WARNING: 'UsePAM no' is not supported in this build and may cause several
98 # problems.
99 #UsePAM no
100
101 #AllowAgentForwarding yes
102 #AllowTcpForwarding yes
103 #GatewayPorts no
104 X11Forwarding yes
105 #X11DisplayOffset 10
106 #X11UseLocalhost yes
107 #PermitTTY yes
108 #PrintMotd yes
109 #PrintLastLog yes
110 #TCPKeepAlive yes
111 #PermitUserEnvironment no
112 #Compression delayed
113 #ClientAliveInterval 0
114 #ClientAliveCountMax 3
115 #UseDNS no
116 #PidFile /var/run/sshd.pid
117 #MaxStartups 10:30:100
118 #PermitTunnel no
119 #ChrootDirectory none
120 #VersionAddendum none
```

```
[dgavdadaev@client.dgavdadaev.net ~]$  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh -YC dgavdadaev@server.dgavdadaev.net firefox  
Warning: No xauth data; using fake authentication data for X11 forwarding.  
X11 forwarding request failed on channel 0  
Error: no DISPLAY environment variable specified  
[dgavdadaev@client.dgavdadaev.net ~]$ ssh -YC dgavdadaev@server.dgavdadaev.net firefox  
Warning: No xauth data; using fake authentication data for X11 forwarding.  
X11 forwarding request failed on channel 0  
Error: no DISPLAY environment variable specified  
[dgavdadaev@client.dgavdadaev.net ~]$ █
```

Рис. 18: Ошибка Firefox



```
1  #!/bin/bash
2  echo "Provisioning script $0"
3  echo "Copy configuration files"
4  cp -R /vagrant/provision/server/ssh/etc/* /etc
5  restorecon -vR /etc
6  echo "Configure firewall"
7  firewall-cmd --add-port=2022/tcp
8  firewall-cmd --add-port=2022/tcp --permanent
9  echo "Tuning SELinux"
10 semanage port -a -t ssh_port_t -p tcp 2022
11 echo "Restart sshd service"
12 systemctl restart sshd
13
```

Рис. 19: ssh.sh

Вывод

- Запрещён вход root
- Ограничены доступные пользователи
- Настроены несколько портов SSH
- Разрешён нестандартный порт в SELinux/firewalld
- Настроена аутентификация по ключам
- Созданы SSH-туннели
- Изучены консольные и графические приложения SSH